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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,810	10/29/2003	Tadashi Sano	520.43235X00	6765

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EXAMINER
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GORDON, BRIAN R

ART UNIT	PAPER NUMBER
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1743

NOTIFICATION DATE	DELIVERY MODE
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06/19/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

officeaction@antonelli.com  
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<b>Office Action Summary</b>	Application No. 10/694,810	Applicant(s) SANO ET AL.	
	Examiner Brian R. Gordon	Art Unit 1743	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 October 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Interpretation***

1. While claim 1 recites the block forms a plurality of alternating sheath flows, it should be noted that the term alternating does not add any further structure to the plurality of flows but moreso implies how one intends for fluid flow through the channel. There is no further structure claimed as to control the order or alternating flow of liquids. It is unclear if applicant is intending to claim the two unmixable fluids as elements of the structure. For the purpose of examination the examiner assumes the two fluids are required to be present in the device.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 12 and 15 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claim 12 it is unclear where the hole is located. What is the structural relationship of the hole to the remaining claimed elements? Is the hole in wall of the reaction flow channel?

Claim 15 is directed to a process limitation specifying the method by which the device is made. The process by which an apparatus is formed is not considered further limiting in apparatus claims.

### ***Claim Rejections - 35 USC § 102***

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4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-18 are rejected under 35 U.S.C. 102(e) as being anticipated by

Ismagilov, US 7,129,091.

Ismagilov discloses a method of conducting a reaction within a substrate is provided that comprises introducing a carrier-fluid into a first channel of the substrate; introducing at least two different plug-fluids into the first channel; and applying pressure to the first channel to induce a fluid flow in the substrate to form substantially identical plugs comprising a mixture of plug-fluids. The plug-fluids are immiscible with the carrier-fluid.

The device may have one or more outlet ports or inlet ports. Each of the outlet and inlet ports may also communicate with a well or reservoir. The inlet and outlet ports may be in fluid communication with the channels or reservoirs that they are connecting or may contain one or more valves. Fluid can be introduced into the channels via the inlet by any means. Typically, a syringe pump is used, wherein the flow rate of the fluid into the inlet can be controlled.

In specific embodiments wherein the plugs introduced through the different plug forming regions are mixed, the inlet channels are preferably close together along the first

channel. For example, the first channel may have a diameter of 60  $\mu\text{m}$  that tapers to 30  $\mu\text{m}$  at or near the plug-forming regions(column 15 lines 24+).

A typical substrate according to the invention comprises a carrier-fluid inlet that is part of and feeds or communicates directly with a first channel, along with one or more plug fluid inlets in communication with the first channel at a plug-forming region situated downstream from the main inlet (each different plug-fluid inlet preferably communicates with the first channel at a different plug-forming region).

Plugs formed from different plug-fluids or solutions may be released in any order. For example, an aqueous solution containing a first plug-fluid may be released through a first inlet at a first plug-forming region. Subsequently, plugs of an aqueous second plug-fluid may be released through a second inlet at a second plug-forming region downstream of the first inlet.

The device as illustrated in Figures 5 and 6, (column 19, lines 1+, column 28, line 35+) is equivalent to that as claimed by applicant. A plurality of such blocks can be seen in figure 19.

The channels are rendered hydrophilic or hydrophobic by pretreating a channel or region of a channel such that a channel or channel surface becomes predominantly hydrophilic or hydrophobic. As discussed in more detail below, substrates with hydrophilic channel surfaces may be fabricated using methods such as rapid prototyping in polydimethylsiloxane. The channel surface can be rendered hydrophobic either by silanization or heat treatment.

The table in FIG. 23 shows the distribution of the pressure drop, flow velocity, and flow time as a function of the channel cross-section dimensions. A transition from a 1  $\mu\text{m}$  wide to 3  $\mu\text{m}$  wide channels should occur smoothly, with plugs maintaining their stability and decreasing their velocity when they move from a 20  $\mu\text{m}$  wide into a 50  $\mu\text{m}$  wide channel.

In another aspect according to the invention, after plugs are formed as described above for the microbatch system, slow evaporation through a very thin PDMS membrane (or another membrane with slight water permeability) (separation portion) is preferably used for added control over the crystallization process.

### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Touzov, Igor; Desmond; Sean M. et al.; Borrelli; Nicholas F. et al.; Chen, Shiping; Hillman; Robert S. et al.; Manger, Ian David et al.; Quake, Stephen R. et al.; Gong, Haiqing et al.; and Parce; J. Wallace et al. disclose microfluidic channel devices.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is 571-272-1258. The examiner can normally be reached on M-F, Telework Thurs., 1st Fri. Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



brg

**BRIAN R. GORDON  
PRIMARY EXAMINER**

Brian R Gordon  
Primary Examiner  
Art Unit 1743